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HQDNA-AR-48M, Issue 61

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**NUCLEAR WEAPON  
CHARACTERISTICS REPORT**

**ISSUE 61**

**1 OCTOBER 1988**

*Sanitized Version*

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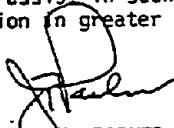
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FOREWORD

This revision of the "48M" Report presents a descriptive resume of the nuclear stockpile and nuclear weapons under development. The report is based on the most recent data and contains the latest references. Users are cautioned that the dynamic nature of nuclear research requires that data should be verified through the source agency prior to its authoritative use. The Defense Nuclear Agency is available to assist in such efforts as well as to provide information in greater depth.



J. T. PARKER -  
Vice Admiral, U.S. Navy  
Director

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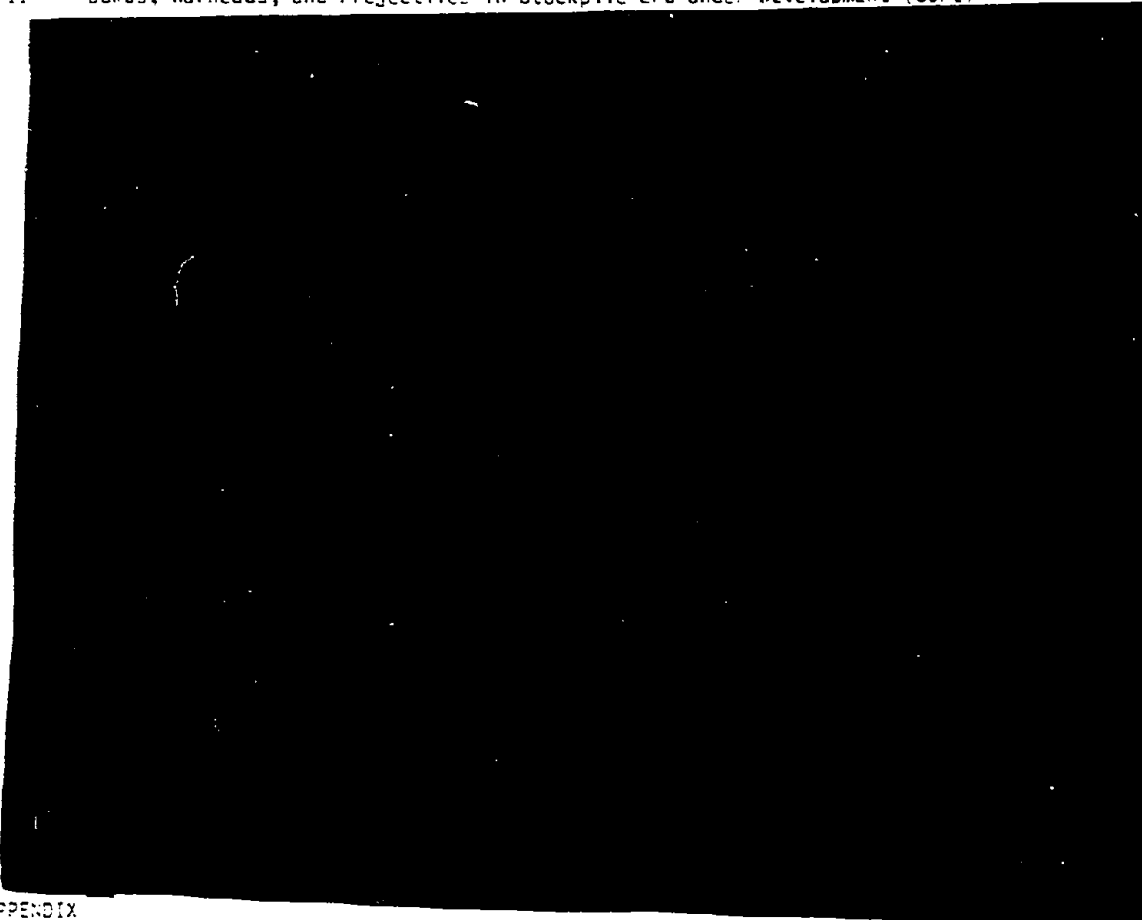
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## INTRODUCTION

1. **Contents:** This report summarizes pertinent technical information for each nuclear warhead or bomb and its various applications. These summaries are published for information only. The various warhead applications and their respective adaption kits are the responsibility of the Services concerned, and persons interested in the details of these applications should refer to applicable Service publications.

2. **Requests for Copies or Changes:** Requests for copies, comments, or any changes or updates to this report should be made to the Commander, Field Command, Defense Nuclear Agency, ATTN: FCPSP, Kirtland AFB, New Mexico 87115-5000; in accordance with current Service directives.

3. **References:**

a. References cited refer to officially published manuals and other applicable documents prepared by agencies of the Department of Energy (DOE) and the Department of Defense (DOD). These references include such documents as Joint Nuclear Weapons Publications, Sandia National Laboratories reports, committee minutes, and pertinent Service reports.

b. Joint Nuclear Weapons Publications numbers, assigned in accordance with Technical Publication (TP) 0-1, are referenced where applicable. TP 0-1 contains an explanation of the Joint Nuclear Weapons Publication System and a complete numerical index to all Joint Nuclear Weapons Publications. Refer to TP 0-1 if it is desired to consult technical publications applicable to a specific item.

c. Appendix A is a bibliography on nuclear weapon effects. A more complete bibliography can be found in DASIAC 88-336, prepared by DASIAC/Kaman Sciences Corporation-Tempo Division. Requests for this document shall be referred to Director, Defense Nuclear Agency, Washington, DC 20305-1000.

4. **Topics Not Included:**

a. This report does not include test and handling equipment information or a comprehensive list of major components. Such information is contained in the current edition of TP 4-24, "Production Nomenclature List of MC, H, T, CF, CT, and DE Items With Applications."

b. This report does not include information on the nuclear weapon vulnerability program. Refer to Appendix A for listing of publications. Copies of these documents may be obtained from Defense Technical Information Center (DTIC), Cameron Station, Alexandria, VA 22304-6145. DTIC form 55 should be used for requests.

c. This report does not include information on weapon quality assurance and reliability.

5. **Weapon Designation System:** Weapons and other major assemblies which are designed, produced, or procured by DOE, and delivered to the DOD as war reserve (WR) material, or for training, testing, or evaluation, are identified by an alphanumeric designation constructed from appropriate elements listed in the following paragraphs. The alphanumeric designation is used to identify weapons, warheads, and major assemblies. The construction of a major assembly designation depends on the definition, requirements, and the following elements:

a. The abbreviation for the major assembly (e.g., B-bomb; W-warhead). No specific abbreviation has been designated for projectiles.

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- b. [REDACTED] The Y number, which identifies a unique capability of a major assembly.
- c. [REDACTED] A number which identifies the modification (Mod) made to the major assembly.
- d. [REDACTED] The word TYPE followed by a number, or a combination of a number and a letter, to identify a non-war reserve major assembly. (Refer to para. 9.)

6. [REDACTED] Nomenclature: The nomenclature of components used in this report was taken from TP 4-24. Words and phrases peculiar to the military field of nuclear energy are defined in TP 4-1, "Glossary of Nuclear Weapons Materiel and Related Terms." A list of acronyms and abbreviations can also be found in Appendix E.

7. [REDACTED] Definitions of Dates:

- a. [REDACTED] First Production Unit Date--Trainer FPU(TR): The month in which it is planned to deliver the first production trainer unit to the DOD.
- b. [REDACTED] First Production Unit Date--Operational Suitability Test FPU(OST): The month in which it is planned to deliver the first production operational suitability test unit to the DOD (normally delivered 1 month after FPU(TR)).
- c. [REDACTED] First Production Unit Date--War Reserve FPU(WR): The month in which it is planned to deliver the first production war reserve unit to the DOD (normally 3 months after FPU date - TR).
- d. [REDACTED] Operational Availability Date (OAD): The date on which a specified number of the first war reserve weapons in a specific weapon project becomes available for immediate operational use or stockpile.

e. [REDACTED] Design Release Date (DR):

(1) [REDACTED] Army: U.S. Army Materiel Command--A release on the date of acceptance by the responsible commodity command(s) or commodity arsenal(s) of a design suitable for industrial engineering. This release may, in appropriate cases, be preceded by partial releases for preliminary industrial engineering.

(2) [REDACTED] Navy: Chief of Naval Materiel--The scheduled date for release of the design of the weapon (less warhead) to production.

(3) [REDACTED] Air Force: Air Force Weapons Laboratory--There is no date or terminology in use by the Air Force which can be defined as design release date.

NOTE: [REDACTED] DOE-produced production quality training weapons and production quality test and handling equipment are normally produced and delivered 90 days before FPU(WR) date. It is important to note that these TP and OST dates apply to completion of first production material. The remainder of the required production is completed subsequently and may even be delivered after the FPU(WR) date. This procedure is in accordance with DOE-DNA agreements. Distribution of weapons is in accordance with the Services-DNA pro-rata distribution agreement.

f. [REDACTED] Initial Operational Capability (IOC) Date: The date when the first combat unit is equipped, trained and logistic support established to permit performance of combat missions in the field. An initial operational capability date is associated with each new system as a target date for delivery of combat equipment, repair parts, maintenance equipment and publications plus supply of trained personnel.

8. **Nuclear Materials:** The amounts of nuclear materials in each warhead in stockpile or under development are listed in section 11. The listed materials are tritium, oralloy, and plutonium. Oralloy is defined as uranium enriched to 93.15 percent by weight of uranium-235 (U-235).

9. **Weapon Type Definitions:** TYPE weapons are non-war reserve, nonnuclear configurations that are designed and produced for the DOE and its design laboratories, and the DOD for testing, training, and evaluation. TYPE weapons that do not conform to any of the listed definitions may be identified by the next sequential letter-suffix within a program, e.g., TYPE 2G, TYPE 3E, etc. Differences in function of a basic TYPE which does not change the design, i.e., a frequency difference, are identified by a numerical suffix after the TYPE designator, e.g., TYPE 2F-1, TYPE 2F-2, etc. Approved types are defined as follows:

a. **Tests Units:**

**TYPE 1** is reserved for DGE-DOD nuclear test weapons. (No longer assigned.)

b. **Flight Test Units:**

**TYPE 2** identifies a nonnuclear weapon with live high explosive (HE). It differs from the WR major assembly only as defined in configuration conferences.

**TYPE 2A** is similar to a TYPE 2, except that it contains a passive instrumentation package.

**TYPE 2B** is similar to a TYPE 2, except that it contains a radio frequency informer instrumentation package.

**TYPE 2C** is similar to a TYPE 2, except that it contains no HE and differs from the WR major assembly only as defined in joint configuration conferences.

**TYPE 2D** is similar to a TYPE 2C, except that it contains a passive instrumentation package.

**TYPE 2E** is similar to a TYPE 2C, except that it contains a radio frequency informer instrumentation package.

**TYPE 2F** is similar to a TYPE 2E and differs only as defined in the joint configuration conference.

**NOTE:** TYPE 2 units are similar in design to Joint Test Assemblies (JTA). TYPE 2's are ordered by the DOD for Operational Suitability Tests and JTA's are specified for Joint Flight Test Programs. The Navy uses the TYPE 2 designation, and the Army and Air Force use the JTA designation.

c. **Military Training Units:**

**TYPE 3** identifies a trainer configured to provide loading, handling and limited maintenance training to operational (i.e., using unit) personnel. Exceptions: W51 TYPE 3 and S28 TYPE 3 represent a TYPE 3A.

**TYPE 3A** identifies a trainer configured to provide for all authorized DOD operational and maintenance training.

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2. [REDACTED] The M110 self-propelled howitzer weighs 27,000 kg, is 8 m long, and has a maximum speed of 55 km/hr.
3. [REDACTED] The M110A2 self-propelled howitzer weighs 28,000 kg, is about 8 m long, and has a maximum speed of 53 km/hr.



SECTION III

CODED SWITCHES OR PERMISSIVE ACTION LINKS (PAL)

1. INTRODUCTION:

2. DEFINITIONS:

- a. Permissive Action Link (PAL): A family of devices and subsystems designed to reduce the possibility of obtaining a nuclear detonation from a nuclear warhead without the use (insertion) of a controlled numerical code.
- b. Passive Protection: Precludes normal operation of weapon arming and/or firing circuits.
- c. Active Protection: Senses attempts to gain unauthorized access to critical weapon components with an option to respond by initiating weapon disablement.
- d. Mode: Refers to the protected condition (LOCK) or the unprotected condition (UNLOCK) of the PAL.
- e. State: Refers to the condition of the active protection feature (OFF/TEST/ON).
- f. Unlock Code: A preset code used to unlock the PAL.
- g. Off Code: A preset code used to turn OFF the active protection system (APS).
- h. Code Check: Confirms stored code(s) in PAL without affecting weapon PAL mode or state.
- i. Recode: Procedure for changing stored code(s) in PAL.
- j. Code Inhibit: Precludes use of a given code, for any PAL operation other than code check, once that code has been used (lock or unlock).
- k. Limited Try: Counts consecutive incorrect code trials, resets to zero on a correct uninhibited code trial, and is capable of invoking temporary or permanent NO-GO options.
- l. Temporary NO-GO: Precludes PAL operations without special field equipment after a given number of incorrect code trials.
- m. Permanent NO-GO: Precludes PAL operations.

3. DESCRIPTION:

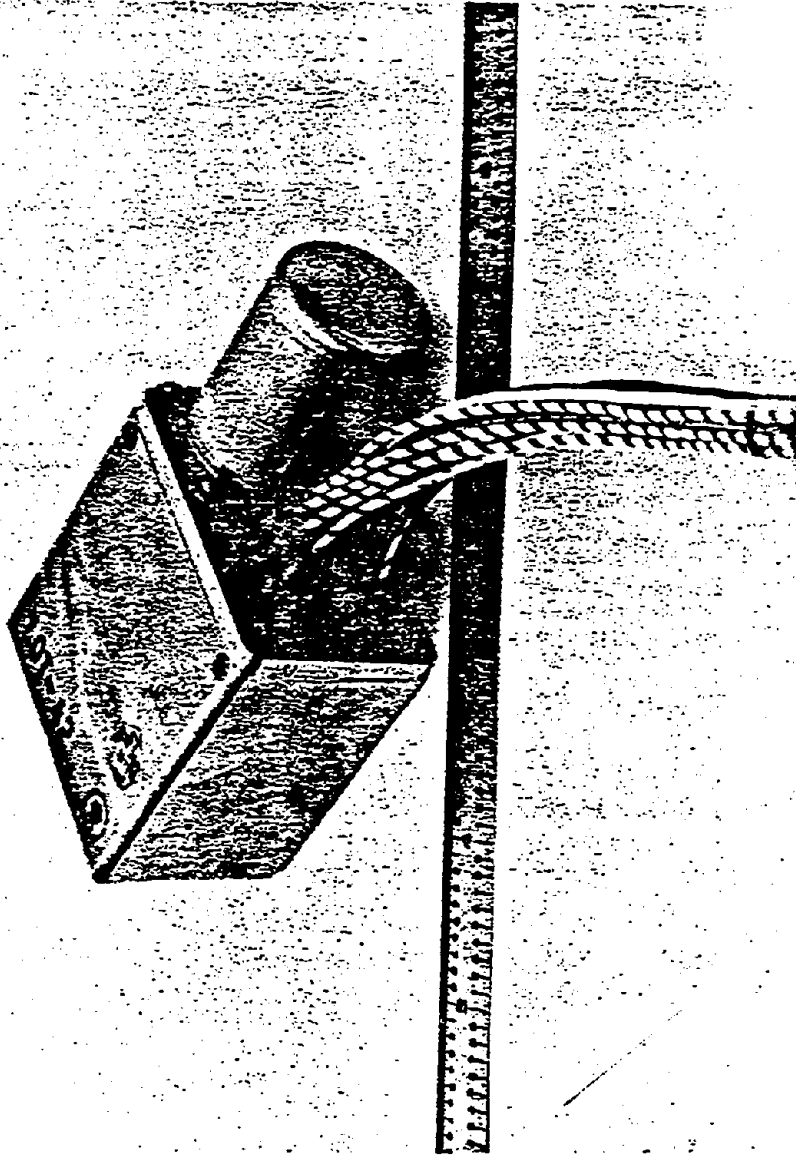


Figure 1 Category A PAL

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APPENDIX A  
REFERENCE DOCUMENTS  
FOR NUCLEAR WEAPONS EFFECTS

The following is a brief listing of nuclear weapons orientation reference documents. Additional reference information on nuclear weapons effects is available through the DCD Nuclear Information and Analysis Center (DASIAC), 816 State Street, (P.O. Drawer QQ), Santa Barbara, California 93102-1479.

A. GENERAL

1. K-80-143(R), 30 Apr 80 [REDACTED] Handbook for Nuclear Weapons Effects Under Arctic Conditions [REDACTED] (C022311)\*

B. AIRBLAST

1. AFWL-TR-81-47, Sep 82 [REDACTED] Nuclear Airblast Summary for High Overpressures [REDACTED] (C029890L)  
(DASIAC 33270)
2. BRL R-1494, Apr 72 [REDACTED] Source Book for Free-Field Nuclear-Environment Data: The Free-Field Blast Environment [REDACTED] (520977L)  
(DASIAC 13725)
3. DASA 1200-I, Mar 71 [REDACTED] Nuclear Weapons Blast Phenomena [REDACTED] (516107)  
(523823L)
- DASA 1200-I, Supplement 1, 18 Jul 72 [REDACTED] (513590)  
DASA 1200-II, Dec 70 [REDACTED] (906986L)  
DASA 1200-II, Supplement 1, Oct 72 [REDACTED]
- DASA 1200-III, Mar 70 [REDACTED] (511266L)  
DASA 1200-IV, 31 Jul 73 [REDACTED] (527669)  
DASA 1200-V, Jun 68 [REDACTED] (503077L)
4. DNA 5648T, 30 Jan 81 [REDACTED] The DNA Nuclear Blast Standard (1-Kt) [REDACTED] (B064540L)
5. DNA 5741T, 1 Jan 81 [REDACTED] Fire, Airblast, and Underground Effects from Nuclear Explosions--Some Current Progress [REDACTED] (B069574L)
6. NSWC/WGL/TR 76-116, 6 Oct 75 [REDACTED] Explosion Effects and Properties, Part I - Explosion Effects in Air [REDACTED] (A013544)  
(DASIAC 23077)

C. GROUND SHOCK, CRATERING, AND EJECTA

1. AFWL-TR-81-144, Mar 82 [REDACTED] Multiple Burst Ground Shock Environments [REDACTED] (B064561L)  
(DASIAC 31859)
2. DASA-1285 (I), May 64 [REDACTED] Nuclear Geoplosics: A Sourcebook of Underground Phenomena and Effects of Nuclear Explosions [REDACTED] (443592)  
(281777)  
DASA-1285 (III), May 64 [REDACTED] (443593)  
DASA-1285 (IV), May 64 [REDACTED] (443589)  
DASA-1285 (V), May 64 [REDACTED]

\*Defense Technical Information Center (DTIC) numbers. These numbers in parentheses are order numbers for the DTIC and should be preceded by "AD."

[REDACTED]

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C. Ground Shock, Cratering, and Ejecta (Cont)

3. DHA 3872F, 31 Dec 75 [REDACTED] Ground Motion Environments for Generic Site Conditions [REDACTED] (B015542L)
4. DHA 6501H-4-1, 1 Mar 79 [REDACTED] Nuclear Geoplosives Sourcebook [REDACTED] (A095096)  
DHA 6501H-4-2, 1 Mar 79 [REDACTED] (A095097)
5. JSR-79-09, Jun 80 [REDACTED] Nuclear Cratering [REDACTED] (103435)  
(DASIAC 32054)
6. TR N-74-1, Jan 74 [REDACTED] Cratering by Explosions: A Compendium and an Analysis [REDACTED] (B024657L)  
(DASIAC 17347)

D. DUST/ICE CLOUDS

1. DASIAC SR-148 (I), 3 Sep 75 [REDACTED] Nuclear Cloud Dimensional Data [REDACTED] (C004535)  
DASIAC SR-148 (II), Dec 78 [REDACTED] (C021120)
2. DHA 3781F, 4 Nov 75 [REDACTED] Nuclear Precursor Phenomenology and Sweep-Up Dust Cloud Model Development [REDACTED] (B009947L)
3. DHA 5508F, 1 Nov 80 [REDACTED] Nuclear Cloud Data and Predictive Uncertainties [REDACTED] (C026949)
4. DHA 5832T, 1 Jul 81 [REDACTED] Introduction to Nuclear Dust/Debris Cloud Formation [REDACTED] (A11454E)

E. UNDERWATER SHOCK

1. C-1590, Jan 69 [REDACTED] Aids for Rapid Estimation of Weapons Effects [REDACTED] (505496)  
(DASIAC 16979)
2. DASA 2450-1, Oct 68 [REDACTED] Handbook of Explosion-Generated Water Waves [REDACTED] (845485L)  
DASA 2450-2, Dec 69 [REDACTED] (506914L)
3. DHA 1240H-1, Mar 71 [REDACTED] Handbook of Underwater Nuclear Explosions [REDACTED] (523834)
4. DHA 5210F, 21 Dec 79 [REDACTED] Surface Wave Prediction for Explosions in Shallow Water [REDACTED] (C022973)
5. NSWC/WOL NP 76-15, Sep 76 [REDACTED] Wave Making by an Underwater Explosion [REDACTED] (A038276)  
(DASIAC 25627)
6. NSWC/WOL TR 76-116, 22 Feb 78 [REDACTED] Explosion Effects and Properties: Part II - Explosion Effects in Water [REDACTED] (A056694)  
(DASIAC 26328)

F. THERMAL RADIATION

1. AFGL-TR-80-0184 (I, II, and III), 15 May 80 [REDACTED] Nuclear IR Data Review [REDACTED] (C032356, 57, and 58)  
(DASIAC 33599, 600, and 601)

F. Thermal Radiation (Cont)

2. DASA 1589 Part A, Aug 65 [REDACTED] Theoretical Models for Nuclear Fireballs [REDACTED] (825746L)  
DASA 1589 Part B, Jun 66 [REDACTED] (386697L)
3. DNA 2500H-1A, 1 Apr 81 [REDACTED] Nuclear Weapons Thermal Radiation Phenomena [REDACTED] (CG31807)  
DNA 2500H-1B, 1 Apr 81 [REDACTED] (B074914L)  
DNA 2500H-1C, 1 Apr 81 [REDACTED] (C033232)  
DNA 2500H-2A, 26 Jul 74 [REDACTED] (531090L)  
DNA 2500H-2B, 26 Jul 74 [REDACTED] (531091L)  
DNA 2500H-2C, 26 Jul 74 [REDACTED] (531092L)  
DNA 2500H-2D, 26 Jul 74 [REDACTED] (531302L)  
DNA 2500H-2E, 26 Jul 74 [REDACTED] (531303L)  
DNA 2500H-3, 15 Feb 74 [REDACTED] (530246L)
4. NWEF Report 1169(R), Feb 81/82 [REDACTED] The Blast, Thermal, and Nuclear Radiation Environments Produced by Nuclear Detonations over Water [REDACTED] (CG27485)  
(DASIAC 32729)

G. WEAPON OUTPUT AND INITIAL RADIATION PHENOMENA

1. DASA 1892-1, Dec 66 [REDACTED] Weapons Radiation Shielding Handbook [REDACTED] (80489L)  
DASA 1892-2, Feb 68 [REDACTED] (816092L)  
DASA 1892-5, Jun 70 [REDACTED] (707062)
2. DNA 2433F (I), 31 Jul 71 [REDACTED] X-Ray Cross Section Compilation from 0.1 keV to 1 MeV [REDACTED] (890834)  
DNA 2433F (II), 31 Jul 71 [REDACTED] (892128)  
Supplement, 31 Aug 71 [REDACTED] (751588)
3. DNA 4267F, Jul 76 [REDACTED] Radiation Environments from Nuclear Weapons [REDACTED] (AC47389)
4. NDL-TR-53, Jul 65 [REDACTED] Initial Gamma Data from Nuclear Weapon Tests 1948 through 1962 [REDACTED] (365419L)  
(DASIAC 04462)
5. NDL-TR-54, Jun 66 [REDACTED] Gamma Rate Compilation [REDACTED] (375372L)  
(DASIAC 04643)
6. NDL-TR-95, Nov 67 [REDACTED] Neutron Measurements for Weapons Tests from 1959 to 1962 [REDACTED] (385927)  
(DASIAC 06706)
7. NWEF Report 1169(R), Feb 81/82 [REDACTED] The Blast, Thermal, and Nuclear Radiation Environments Produced by Nuclear Detonations over Water [REDACTED] (CG27485)  
(DASIAC 32729)

H. FALLOUT PHENOMENA

1. DASA 1251-1, 27 Jun 61 [REDACTED] Local Fallout from Nuclear Test Detonations [REDACTED] (329971)  
DASA 1251-2-1, Aug 63 [REDACTED] (349123)  
DASA 1251-2-2, Aug 63 [REDACTED] (329124)  
DASA 1251-2-3, Mar 66 [REDACTED] (371725)  
DASA 1251(Supplement), Oct 64 [REDACTED] (358417L)

H. Fallout Phenomena (Cont)

- DASA 1251-3, Nov 66 [REDACTED] (381963L)  
DASA 1251-4-1, Sep 68 [REDACTED] (500919L)  
DASA 1251-4-2, May 72 [REDACTED] (523385)  
DASA 1251-5, May 65 [REDACTED] (362012)
2. DASIAC 30929, 1 Jun 79 [REDACTED] The History of Fallout Prediction [REDACTED]  
(079560)
3. DNA 1251-1-EX, 1 May 79 [REDACTED] Compilation of Local Fallout Data from Test  
Detonations 1945-1962 Extracted from DASA  
1251 [REDACTED] (A079309)  
DNA 1251-2-EX, 1 May 79 [REDACTED] (A079310)
4. DNA 4569F, Mar 77 [REDACTED] Analysis and Comparison of Fallout Predic-  
tion Models [REDACTED] (C018143)
5. DNA 5159F-1, 31 Dec 79 [REDACTED] DELFIC: Department of Defense Fallout  
Prediction System [REDACTED] (A088367)  
DNA 5159F-2, 31 Dec 79 [REDACTED] (G88512)

I. ELECTROMAGNETIC WAVE PROPAGATION AND DEGRADATION

1. DASA 1954-1, Jun 68 [REDACTED] Nuclear Effects on VLF and LF Communication  
Systems [REDACTED] (392160L)  
DASA 1954-2, Sep 68 [REDACTED] (394550L)
2. DASA 1956-1, Oct 67 [REDACTED] Nuclear Effects on Satellite and Scatter  
Communications Systems [REDACTED] (390254)
3. DNA 2524h, Dec 71 [REDACTED] The Trapped Radiation Handbook [REDACTED] (738641)
4. DNA 3499H, 25 Feb 75 [REDACTED] Aids for the Study of Electromagnetic  
Blackout [REDACTED] (A010226)
5. DNA 3673H, 15 Jul 75 [REDACTED] Summary of BMD Radar Systems Degradation  
in a Nuclear Environment [REDACTED] (C003517)
6. DNA 3736T, May 75 [REDACTED] An Introduction to OTH Radar Performance  
in a Nuclear Environment [REDACTED] (C004776)
7. DNA 3964F-I-1, 29 Feb 80 [REDACTED] The Roscoe Manual, Volume I-1 - Program  
Description [REDACTED] (A092917)
8. DNA 4494T, Dec 77 [REDACTED] High Altitude Phenomenology at Very Late  
Times [REDACTED] (C0162C0)
9. DNA 4501F, Dec 77 [REDACTED] Physics of High Altitude Nuclear Burst  
Effects [REDACTED] (A068541)
10. DNA 4697T, Nov 78 [REDACTED] Dust Cloud Modeling and Propagation Effects  
for Radar and Communications Codes [REDACTED]  
(A07136B)
11. DNA 4716F, Apr 78 [REDACTED] Nuclear Effects on Meteor Scatter and  
Adaptive HF/VHF Communication Systems [REDACTED]  
(C017535)

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I. Electromagnetic Wave Propagation and Degradation (Cont)

12. DNA 4690H, 31 May 79 Summary of Communication and Navigation Systems Degradation in a Nuclear Environment [REDACTED] (C019334)
13. DNA 5589F, 1 Jan 81 [REDACTED] TNW C<sup>3</sup> Vulnerability and Survivability Issues [REDACTED] (C028372)
14. DNA-IR-82-01, 4 Apr 82 [REDACTED] A Reasonable Worst Case Specification of Nuclear Disturbed Radio Signals [REDACTED] (C029241)
15. DNA-IR-83-04, Jun 82 [REDACTED] Report from the HF Committee, DNA HANE Summer Study, 82 [REDACTED] (C037541L)
16. DNA-TR-84-250, May 84 [REDACTED] Committee on Optical and Radar Effects (CORE) [REDACTED] (C038722)
17. DNA-TR-85-227, Jul 85 [REDACTED] Environment Models for Mid-Level Weapon Effects Communication (WECOM) Codes [REDACTED] (C040866L)

J. ELECTROMAGNETIC PULSE (EMP) EFFECTS

1. AFWL-TR-80-402, Dec 80 [REDACTED] EMP Interaction: Principles, Techniques, and Reference Data [REDACTED] (A100508)
2. D224-10019-1, 6 Apr 73 [REDACTED] EMP Electronic Design Handbook [REDACTED] (918227L)
3. DNA 2114H-1, 5 Jul 79 [REDACTED] DNA EMP (Electromagnetic Pulse) Handbook [REDACTED] (C019488)  
DNA 2114H-2, 5 Jul 79 [REDACTED] (C019587)  
DNA 2114H-3, 5 Jul 79 [REDACTED] (C019489)  
DNA 2114H-4, 5 Jul 79 [REDACTED] (C019490)  
DNA 2114H-5, 5 Jul 79 [REDACTED] (C019491)  
DNA 2114H-6, 5 Jul 79 [REDACTED] (C019492)
4. DNA 2772T, Oct 77 [REDACTED] DNA EMP Awareness Course Notes, Third Edition [REDACTED] (A058367)\*  
Supplement, 31 Jul 78 [REDACTED] (A053485)\*
5. DNA 3286H, Feb 77 [REDACTED] EMP Preferred Test Procedures (Selected Electronic Parts) [REDACTED] (A039768)
6. DNA 3332F, 16 Sep 74 [REDACTED] Engineering Techniques for Electromagnetic Pulse Hardness Testing [REDACTED] (786722)
7. DNA 3691P, 1 Aug 75 [REDACTED] Proceedings of the AEC/DNA TREE/SGEMP Symposium, 14-17 January 1975 [REDACTED] (C004559L)

\*Order from National Technical Information Service (NTIS), 5285 Port Royal Rd., Springfield, VA, 22161.

[REDACTED]

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J. Electromagnetic Pulse (EMP) Effects (Cont)

8. DNA 3831P, Oct 75 [REDACTED] DNA EMP System Level Testing Seminar (C008356L)
9. DNA 4851P, 1 Jan 79 [REDACTED] Source Region EMP Technology and Systems Survivability Requirements Seminar (C023109)
10. DNA 5687, 28 Feb 80 [REDACTED] Theory of EMP Coupling in the Source Region (A108751)
11. DNA 5702P-1, 1 Apr 81 [REDACTED] DNA EMP Simulation and System Hardening Symposium (C027547)  
DNA 5702P-2, 1 Apr 81 [REDACTED] (B066851L)  
DNA 5702P-3, 1 Apr 81 [REDACTED] (B066852L)
12. DNA-H-84-79, 10 Aug 83 [REDACTED] DEFT Handbook, The Determination of EMP Failure Thresholds--Revised Edition (B099317L)
13. DNA-H-86-60, 15 Nov 86 [REDACTED] DNA EMP Engineering Handbook for Ground Based Facilities (B115101)
14. HDL-SR-83-14, Jul 84 [REDACTED] Communication Facility Design Practices for Protection Against High-Altitude Electromagnetic Pulse (B084755L)
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